

REMARKS

This amendment and response are submitted in reply to the Office Action dated June 21, 2010, in which the Examiner:

rejected claims 12, 13, and 16-25 under 35 U.S.C. § 102(a or e) as being anticipated by U.S. Patent No. 6,492,697 to Plagens et al. or W.I.P.O.

Publication No. 01/74139 A2 to Plagens et al;

rejected claim 26 under 35 U.S.C. § 103(a) as being obvious over W.I.P.O. Publication No. 01/74139 A2 to Plagens et al. in view of U.S. Patent No. 5,530,345 to Murari et al; and

objected to claims 14 and 15 as depending indirectly from rejected base claims, but indicated claims 14 and 15 to be allowable if rewritten in independent form incorporating all limitations of the base claim and any intervening claims.

Applicants respectfully thank the Examiner for acknowledging the allowability of claims 14 and 15, which correspond generally to new claims 29 and 30.

Claims 12-26 have been canceled herein and Claims 27-40 have been added.

Applicants respectfully disagree with the Examiner's interpretation of Plagens, as explained further below. However, in the interest of furthering the prosecution of this application, Applicants have canceled claims 12-26, rejected on the basis of Plagens, and have added new claims 27-38 to more clearly recite the magnetic field sensor. New claims 39 and 40 correspond to previously canceled claims 8 and 10, rewritten with additional recitations.

Applicants respectfully submit that claims 27-38 find support at least in paragraph [0012] of the present application. Applicants respectfully submit that claims 39 and 40 find support at least in previously presented claims 8 and 10, and at least in paragraph [0035] and [0036] of the present application.

Applicants respectfully submit that nothing in the current Amendment constitutes new matter. Amendments to the claims were made for clarity and/or conformity with current U.S. practice.

Regarding new claims 27-38, Applicants respectfully submit that Plagens discloses a Hall element having four contacts (30, 38, 32 and 36) located in the corners of a square. In contrast, the contacts of the Hall element of the present application, as recited in claim 27, are located on a straight line. Therefore, Plagens does not disclose “a Hall element comprising a first contact, a second contact, a third contact and a fourth contact arranged in this sequence along a straight line on a surface of a first well of a first conductivity type,” as recited in claim 27.

Further, the four contacts of the Hall element of Plagens are located at equivalent symmetrical positions, namely at equal distance from the center of the square, and they cannot be separated into two inner contacts and two outer contacts. Therefore, Plagens does not disclose “said four contacts being two inner contacts and two outer contacts,” as also recited in claim 27.

Still further, the structure of the Hall elements of Plagens and of the present application are completely different, and therefore the problems associated with their specific structures are also very different. Plagens discloses that the electrical behavior of the Hall element can be understood by representing the internal resistances as a Wheatstone bridge. A Wheatstone bridge consists of four resistors R_1 to R_4 coupled to each other in a specific manner, and is, as such, only an electrical equivalent circuit of the Hall element. The four resistors R_1 to R_4 represent the internal resistances prevailing between the four contacts of the Hall element. The resistors R_1 to R_4 of the Wheatstone bridge are not additional resistors. The resistors R_1 to R_4 represent the internal resistances of the Hall element. Examples of the additional resistor, denoted as R_5 , are shown for example in FIGS. 4 and 5 of the present application.

With regard to the Hall element of Plagens, the four internal resistances R_1 to R_4 prevailing between the four contacts are of equal size for reasons of symmetry. However, small differences between the resistances result from technological variations during the manufacturing process, e.g. small variations in the local doping and/or small deviations from the set position of the contacts with respect to the well resulting from misalignments of the implantation mask used to make the contacts during the manufacturing process. Therefore, all

contacts are of equal significance, for geometrical symmetry reasons, and therefore all resistances have, apart from technologically conditioned variations in the production process, the same value. There is no specific resistance that is larger or smaller than the other resistances, as is the case with the Hall element of the present application, which has its four contacts situated along a straight line and results in $R_4 > R_1$, $R_4 > R_2$ and $R_4 > R_3$. At least for this reason, Plagens does not need an additional resistor that connects two selected contacts.

With regard to the Hall element of Plagens, the four internal resistances R_1 to R_4 are by nature essentially balanced, are of equal size apart from technologically caused variations. In order to compensate for these variations, which cause an unbalance in the Wheatstone bridge and therefore a small offset in the Hall voltage, Plagens discloses means to change the resistors R_1 to R_4 in order to balance the Wheatstone bridge. However, these means are not an additional resistor that connects any two contacts. Therefore, Plagens does not disclose "two outer contacts connected via an additional resistor having a resistance R_5 that is selected such that approximately $R_1 = R_2 = R_3 = R_4 \parallel R_5$ wherein R_4 denotes a resistance prevailing between the first contact and the fourth contact," as recited in claim 27.

Therefore, at least for the reasons presented above, new claim 27 is not anticipated by Plagens and new claim 27 should be passed to issue.

Since new claims 28-38 depend from new claim 27 and contain additional recitations thereto, for at least the reasons stated above regarding the patentability of claim 27, new claims 28-38 should also be passed to issue.

In addition, new claims 29 and 30 correspond to cancelled claims 14 and 15 which were objected to as being dependent upon a rejected base claim, but were indicated to be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With regard to the rejection of former claim 26 in view of Plagens and Murari, reconsideration is respectfully requested in view of new claim 39. Claim 39 is directed to two Hall elements, each having four contacts situated in a straight line. The two Hall elements are arranged such that the straight lines of them run in parallel. As discussed above with respect to new claim 27, Plagens

does not disclose a Hall element having four contacts arranged along a straight line, but rather presents a Hall element having four contacts situated in the corners of a square. The four contacts of the two Hall elements, as recited in claim 39, are coupled in a prescribed manner in order to reduce the offset voltage of the Hall elements resulting from their unbalanced internal resistances.

Murari discloses a plurality of Hall elements that are aligned side-by-side in a predetermined direction. With reference to Murari's pair of Hall elements shown in FIG. 7, the contacts of the Hall elements are not connected to each other, but the two Hall elements do share both a common well and one of the voltage contacts. This is done to save space with regard to the embodiment shown in FIG. 6, and not for balancing resistances. Further, the other contacts of the two Hall elements are not coupled with each other and therefore no additional resistance path is added to the Hall elements.

As a result of the two Hall elements shown in Murari's FIG. 7 sharing the same well, Murari's pair of Hall elements are not electrically isolated from each other, because the Hall elements share one voltage contact. Therefore, Murari's pair of Hall elements have a total of seven (7) contacts ($8-1 = 7$). In contrast, the coupled Hall elements, as recited in claim 39, are isolated from each other and do not share any contacts. Resulting in the coupled Hall elements, as recited in claim 39, having a total of eight (8) contacts.

The coupling of the contacts of two Hall elements, as recited in claim 39, is not a mere duplication, as alleged by the Examiner, but provides further reduction to the offset voltage of the coupled Hall elements.

A mere duplication of Murari's pair of Hall elements would result in the following structure:

- the first contact of the first Hall element would be coupled to the first contact of the second Hall element;

- the second contact of the first Hall element would be coupled to the second contact of the second Hall element;

- the third contact of the first Hall element would be coupled to the third contact of the second Hall element;

- and the fourth contact of the first Hall element would be coupled to the fourth contact of the second Hall element.

However, this is not the structure recited in claim 39. Specifically, claim 39 recites the contacts of the two Hall elements being coupled in a different manner.

Therefore, at least for the reasons presented above, new claim 39 is not rendered anticipated or obvious by the cited art and should be passed to issue.

Since new claim 40 depends from new claim 39 and contains additional recitations thereto, for at least the reasons stated above regarding the patentability of claim 39, new claim 40 should also be passed to issue.

Applicants believe that no fees are due in connection with this amendment and response. If any fees are deemed necessary, please charge them to deposit account 13-0235.

As Applicants have addressed each of the rejections in light of the newly presented claims, favorable consideration is requested.

Respectfully submitted,

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